

Feasibility Study of 3D-Printed Surgical Simulation Model for Eye Bank Technician Training

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Financial Disclosures

- We have no relevant financial disclosures.

Background

- Potential for a human tissue alternative in the setting of training and evaluation of in-situ recovery technicians was identified.



Image courtesy of BIONIKO

Purpose

- To assess a prototype of the BIONIKO 'Cordelia' (BC) Model



Image courtesy of BIONIKO

Methods

Four successive iterations of a 3D-printed corneoscleral model were evaluated for suitability in technician training. Training experience evaluated based on the following factors:

- Pliability
- Rigidity
- Form
- Instrument Access
- Similarity to human tissue experience
- Consistency throughout product

Methods: Model Overview

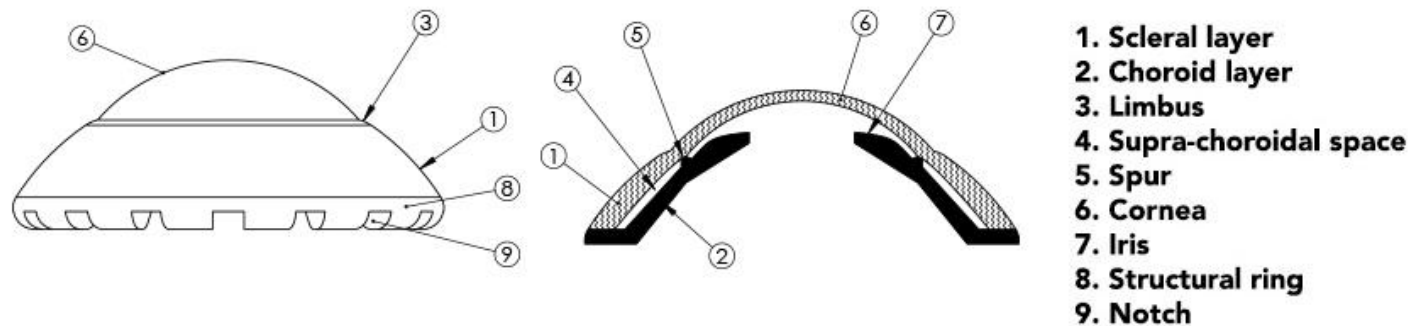


Image courtesy of BIONIKO

Methods: Recovery Procedure

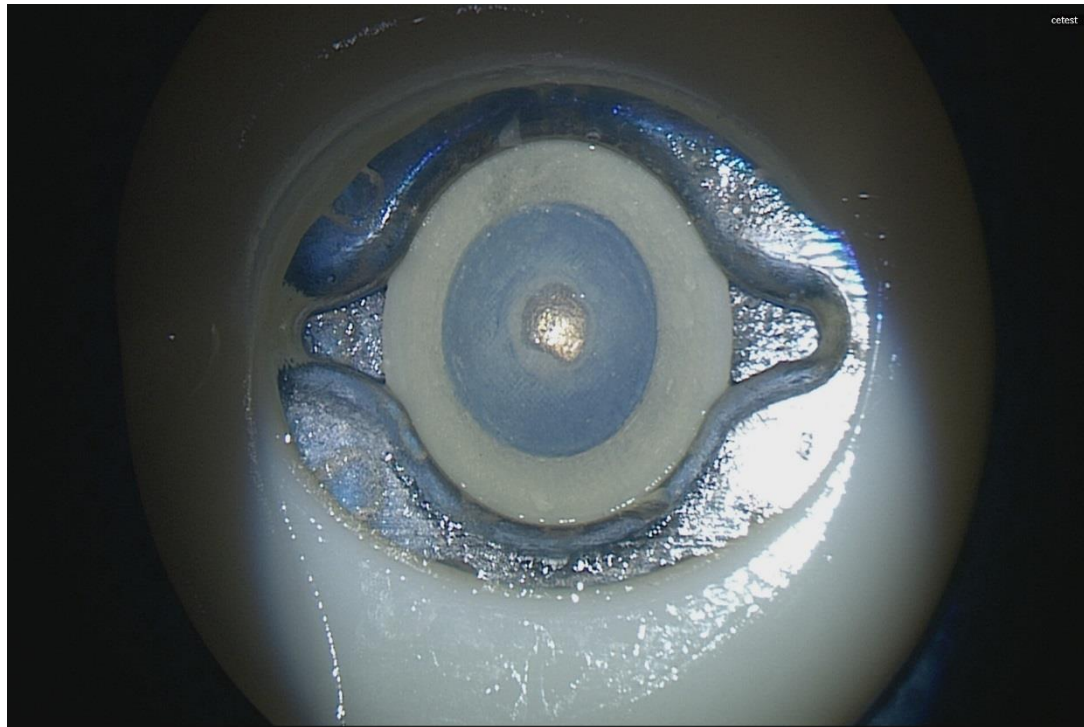
BIONIKO CORDELIA
DEMONSTRATION

Results

- Areas for improvement in the product were identified and addressed with each subsequent iteration.
- The final model yields similar results in all trials.

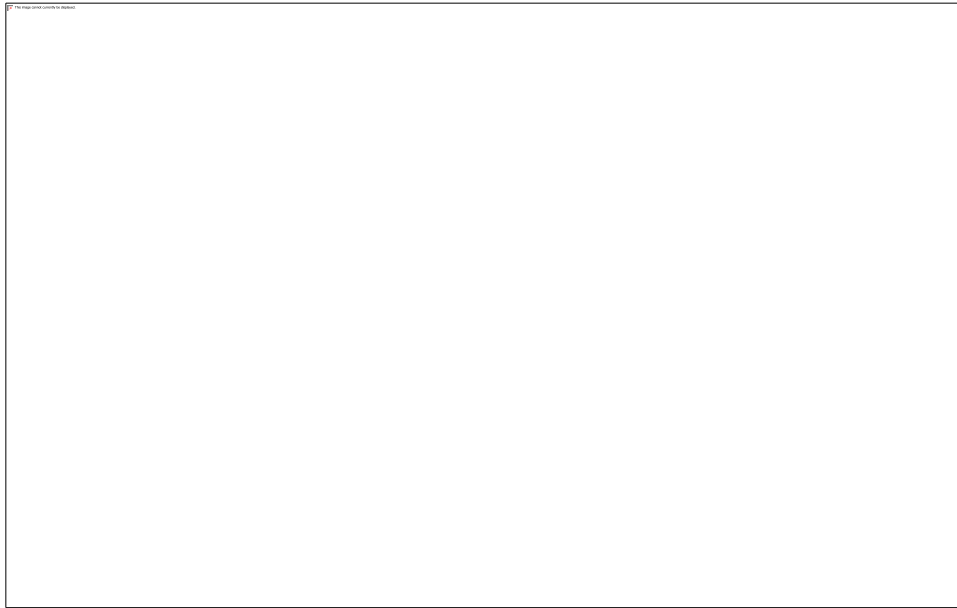
Results

- BC size/shape consistent with expected size/shape of human corneoscleral rim.



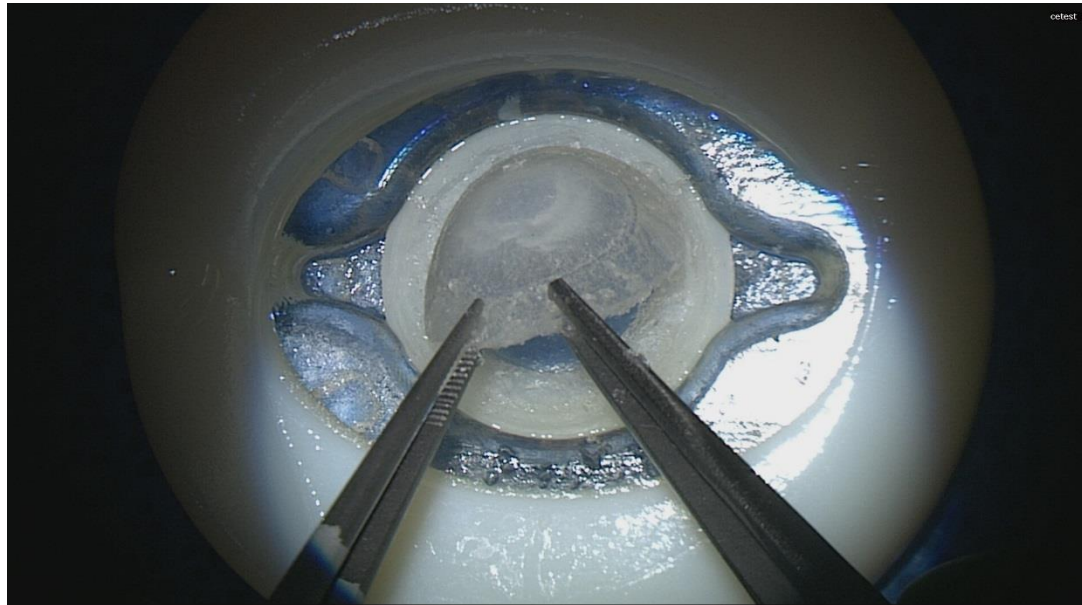
Results

- Available space/design does not allow for insertion of speculum; given that 'eyelid' is stationary, speculum deemed unnecessary. Ability to trephinate and excise in usable space satisfactory.



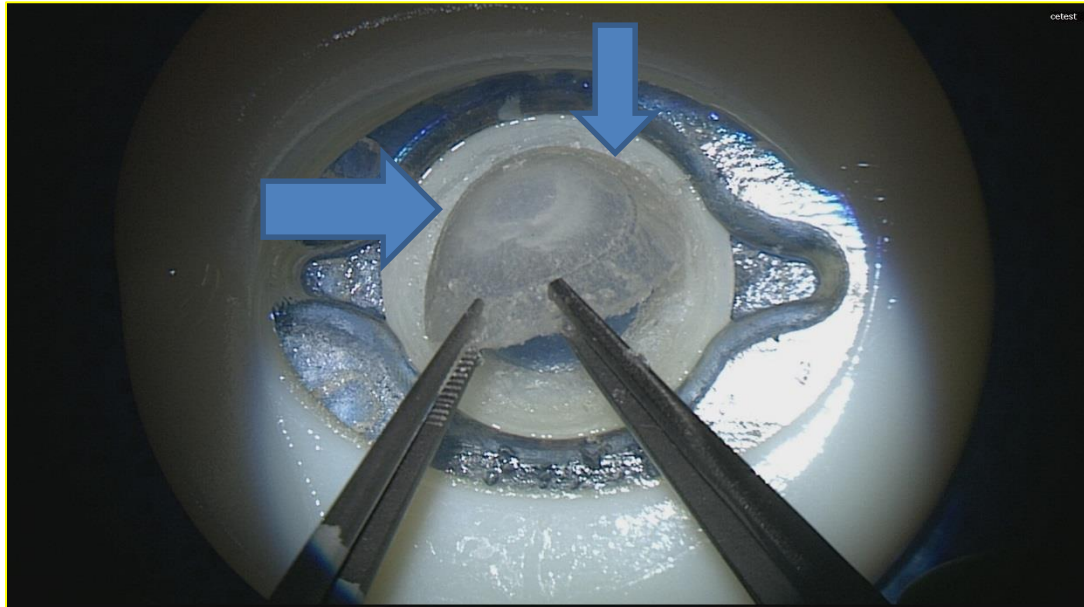
Results

- BC maintains cornea shape throughout process, outside setting of excessive pressure/pulling.



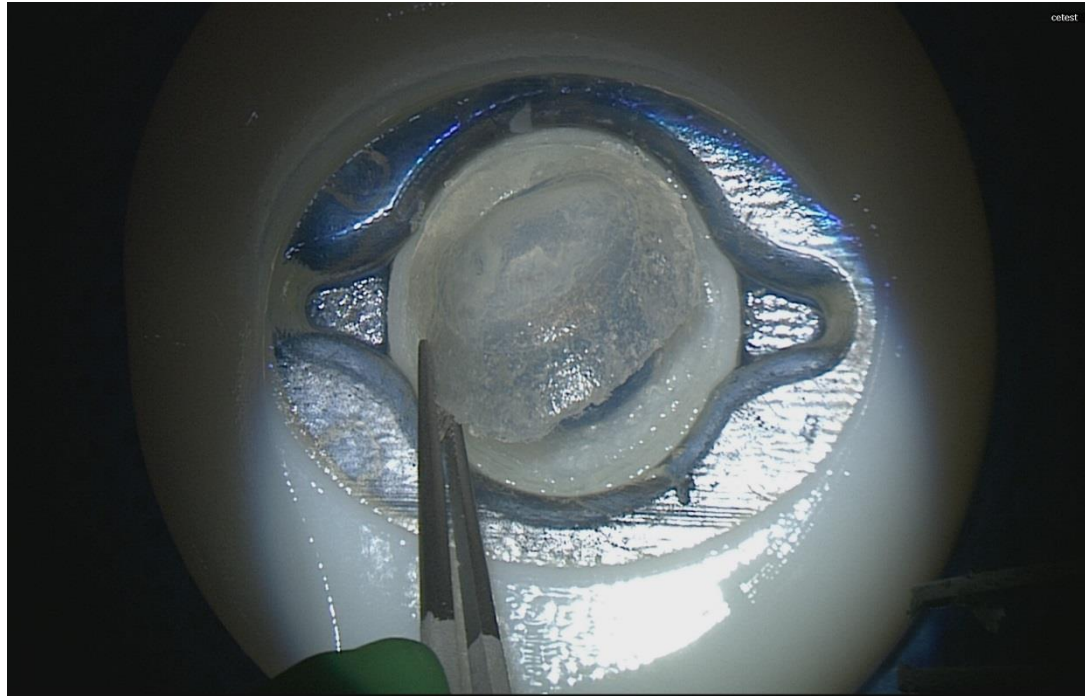
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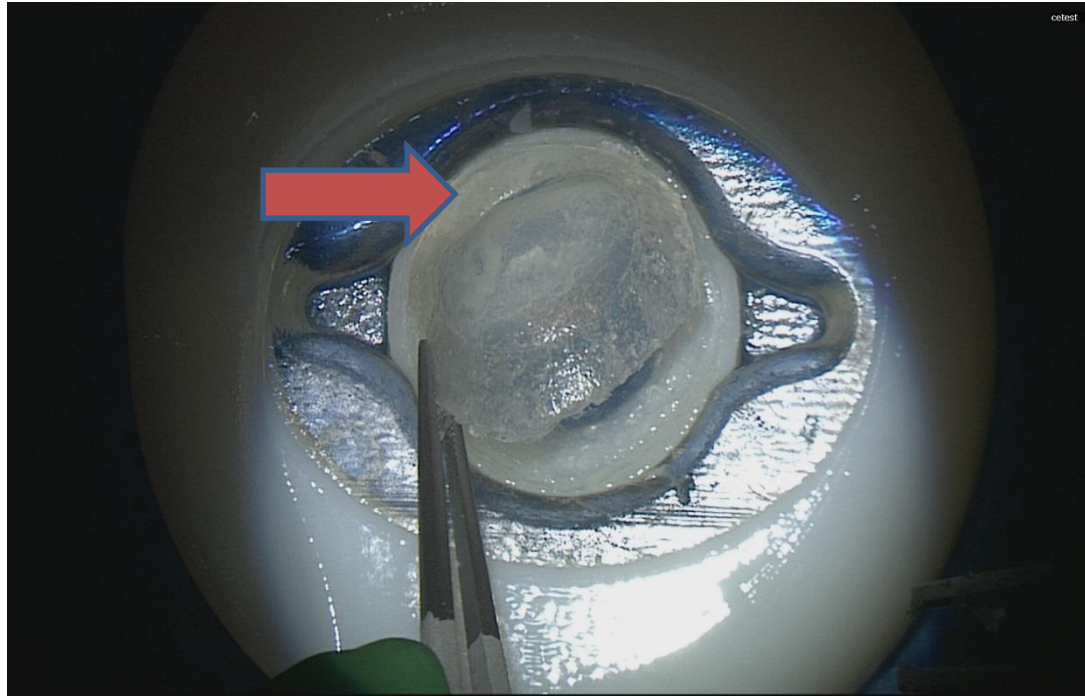
Results

- BC 'tissue' yields appropriately to forceps and blades; bends/folds as expected when exerting excessive pressure.



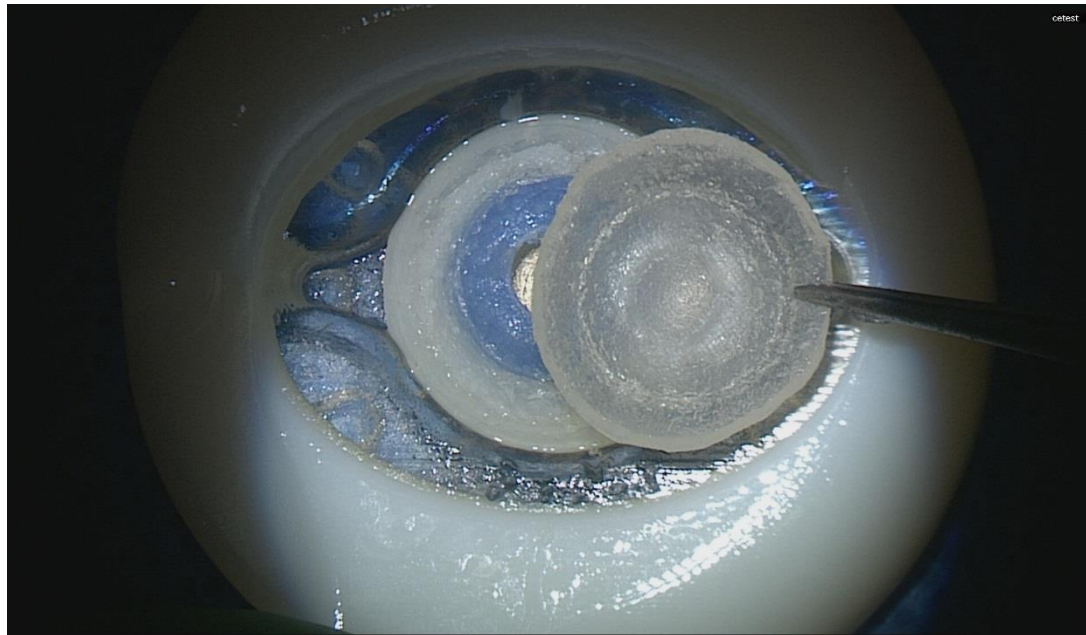
Results

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Results

- Simulated tissue, while noticeably dissimilar to human tissue, provides similar anatomical structures for evaluation. Trephination, separation of scleral spur, separation of choroid at limbus represented in a fashion comparable to human tissue.



Discussion

- The BC model allows for training and eval outside the donor setting – compares favorably to frozen tissue.
- No tracking of tissue- QA approved!
- Minimizes resources allocated to recovery.
- No risk of transmission from tissue.
- Allows for eval/observation of remote staff at any time, regardless of donor availability.

Training Flexibility

Training tissue is invaluable and is a necessary part of the process. A recovery simulation tool provides flexibility to the options we have to bring technicians up to speed and verify competency, without going through the recovery process.

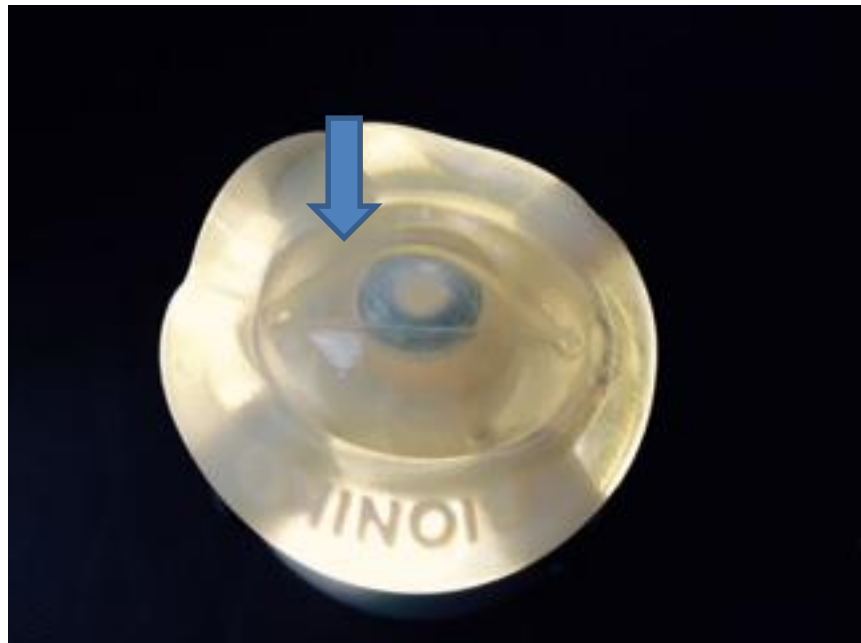
Model Limitations

- No lids
- No lashes
- No conjunctiva
- No vitreous
- Soaking of the model changes pliability

New Additions



Slide added June 4, 2015



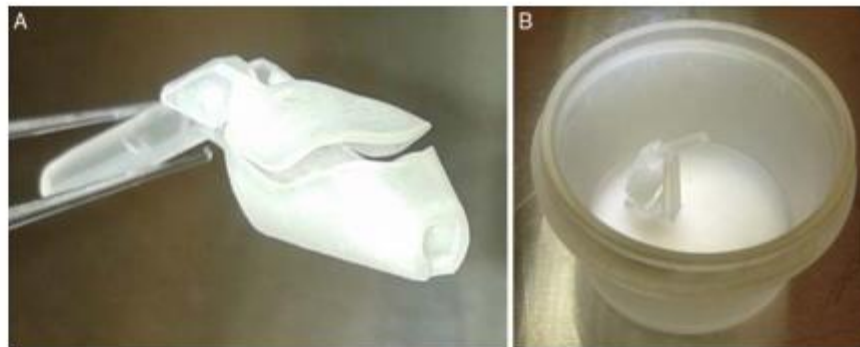
Discussion

- 3D printing lowers the barrier to incremental improvements in technology
- Limits to improvements are limited by our imaginations



Qindao Unique bioprinted cornea
www.3dprint.com

Figure 5 Three-dimensional printed devices ready to use. (A) The assembled glide (cap to the glide) with specific measurements and (B) final version of the glide inside the lenticule preservation container.



Acknowledgements

- Recovery staff of Lions VisionGift
- Andres Bernal, BIONIKO